

REMARKS:

This application has been carefully studied and amended in view of the Office Action dated October 19, 2004. Applicant, Daniel Friel, Sr. and the assignee's representative Daniel Friel, Jr. and the undersigned attorney wish to thank Examiner Shakeri for the many courtesies, his cooperation and the helpful suggestions made by him during the course of a personal interview on January 5, 2005. The following amendment incorporates matters discussed at the interview.

Independent claims 1, 13, 39 and 40 have been canceled. Claims 54-57 have been added. Claims 54-56 are readable on the elected invention. By the cancellation of the four noted claims and by the addition of claims 54-57 the same total number of claims remains in the application as well as the same total number of independent claims. One of these independent claims is allowable claim 11 written in independent form. Accordingly, a fee should not be required for this amendment. If any fee is required the Commissioner is authorized to charge such fee to deposit account no. 03-2775.

In placing claim 11 in independent form former dependent claim 11 has been amended to include the features of former parent claims 7 and 1 and in addition to take into account the rejection under 35 USC §112. It is noted that the recitation in former claim 1 of the hardened surface being at least as hard as

the metal of the knife blade has not been repeated in independent claim 11 because the knife blade itself is not part of the claimed apparatus.

Figure 11A has been added to illustrate the subject matter of claim 51 as required in the Office Action. In addition, Figures 10 and 16A have been amended so that there is a consistent illustration of the angles A, B and C. In that regard, in the conditioning apparatus the angle A is the angle between the facet 2 and the guide surface. The angle B is the angle between the facet 2 and the surface 5 of hardened object 13. The angle C is the angle between the guide surface and the surface 5 of the hardened surface. Angle A plus angle B equals angle C. As pointed out in the specification, in the sharpening stage the facet is in surface contact with the plane of the abrasive surface. Thus angle B would be zero degrees and angle A would equal angle C. Page 7, for example, points out that each facet is sharpened at angle A. Page 16 points out with respect to the sharpening stage of Figure 10, that the "guide surfaces 8 and 8a [are] set at angle A relative to the plane 11 of a sharpening abrasive layer..." and that the positioning of the blade on the guide plane results in "creating" a facet 2 whose plane will be created precisely at angle A relative to the face 3 of the blade." Figure 10 has been amended to more clearly show the facet 2 at the angle A where it is in surface contact (i.e.

at an angle B of zero degrees) with the plane of the sharpening abrasive layer. The drawings now consistently refer to the angle of the facet to the guide surface as angle A in both the sharpening stage and in the conditioning stage. Angle C, however, is solely designated in the conditioning stage as the angle between the guide surface and the hardened surface. The comparable angle in the sharpening stage is angle A because, in the sharpening stage, there is no angle B (i.e. angle B is zero degrees) and angles A and C are therefore the same. It is believed that as now illustrated each of these angles is properly labeled in their appropriate figures. If Examiner Shakeri believes that there is still an inconsistent indication of any of these angles he is requested to contact the undersigned attorney and an appropriate amendment will be made.

The specification has also been amended with regard to various comments made by Examiner Shakeri in the Office Action. Specifically, page 3 has been amended to delete reference to the classification of various prior art patents. In addition, the grant date of the patents has also been deleted. Page 14 has also been amended for the sake of accuracy. Page 16 has been amended to recite at one location a description of the angles A, B and C. Page 16 also has been amended to refer to newly added Figure 11A. Page 20 has been amended to provide in the specification the antecedent basis for the "restraining

mechanism" and "braking mechanism" as recited in Claims 9 and 10 in view of the rejection of those claims as being indefinite since the quoted terms are not found in the specification. Page 27 has been amended for the sake of accuracy.

In amending and in adding various claims the comments by Examiner Shakeri with regard to the rejection of certain claims under 35 USC §112 have been taken into account. It is noted that claim 39 has been canceled. Accordingly, the rejection under Section 112 is now moot.

During the interview it was understood by applicant and his representatives that the application contained allowable subject matter and that what would be necessary to describe this allowable subject matter in the claims is to distinguish the hardened surface which is used for conditioning the blade edge from conventional sharpening devices.

The present invention represents a marked departure and significant distinction from prior art techniques which enhance the edge of a blade. To appreciate these differences, the following discussion will refer to dictionary definitions and to statements in the specification by referring to numbered paragraphs in the printed copy of the application US2004/198198 ("Friel application").

Dictionary Definitions

With the help of Webster's New World College Dictionary the formal definition of "sharpen" and "sharp" is established as it pertains to sharpeners.

"Sharp" is defined as 1) suitable for cutting or piercing; having a very thin edge or fine point, keen, 2) having a point or edge; not rounded or blunt; (Webster New World College Dictionary, Fourth Edition)

alternately

"Sharp" is defined as 1: adapted to cutting or piercing as
a: having a thin edge or fine point;

"Sharpen" is defined as: to make sharp or sharper.
(Webster's New Collegiate Dictionary, Third Edition.)

A sharpener is a device to sharpen, hence to make a thin keen edge or fine point. In contrast, the edge created by the present invention does not have a thin edge or fine point, instead the edge intentionally contains imperfections described as microblades.

The Present Application Describes The Differences Between A Sharpened And A Conditioned Edge

In the Friel application the disclosure differentiates

between sharpening and conditioning in several ways:

(0002) "This application relates to a precision means for creation of microblades along the edge of a cutting blade."

(0004) "This application discloses precision means of creating micro imperfections of controlled size and frequency along the edge of blades."

(0005) "This application describes highly precise mechanisms and devices that for the first time offer controlled means for preparing reproducibly edges of high geometric precision with microblades at the terminus of the edge facets and along the edge profile. Such imperfections can range in size from a fraction of a micron up to more than 100 microns. Imperfections of this size can function as microblades especially if the microblades are confined largely within the geometric confines of the facets and with the geometric extensions of the original facets to the point where they would otherwise meet to form an edge of thickness generally less than 20 microns."

(0013) "A small microserrated structure is created."

(0014) "The existence of a series of microblades or imperfections along the edge can be an added advantage to cut..."

"For these reasons close control of all factors affecting this edge conditioning step are important in order to optimize the profile of the final edges and any imperfections or microblades created along that edge."

(0021) "The additional pressing of the resulting edge structure against a hardened surface at a precisely controlled angle leaves a surprisingly regular fine microtooth structure along the edge as shown."

(0026) "It is important to recognize that this controlled repetitive action described here to develop microstructures along the edge is radically different from conventional sharpeners that use skiving actions to remove an entire facet quickly in just one or a few strokes and to thereby establish new facets and a new knife edge. The conventional skiving devices are analogous to conventional sharpening devices that are designed to form a new edge by removing in entirety the old facets and replacing them with new facets...."

(0044) "Instead this invention is a precision operation to remove carefully the burr of a knife that previously had been sharpened conventionally...to...remove the burr, to fracture the edge at the point of burr attachment and to create a relatively uniform microstructure along the edge."

(0045) "This invention is a unique means to condition a conventionally sharpened edge so that a highly effective microstructure is established along the edge..."

(0053) "The sharpening process which must be designed to create full facets at the desired angle can be carried out by any of the conventional means known to those skilled in sharpening including abrasive and skiving means..."

"The process of creating an optimum microstructure along the knife edge depends upon starting with a blade that has been sharpened sufficiently to establish well defined facets then by applying pressure at a low angular difference B alternating on one side, then the other side of the edge until any burr remnants are removed leaving a microstructure along the edge."

(Note this last reference describes how a sharpened edge creates well defined facets that are subsequently converted to a conditioned edge.)

Comment: These excerpts from the Friel application disclose that this new conditioning technique creates an edge that is radically different from a "sharpened" edge defined as "having a very thin or fine point." Instead the conditioning purposefully creates an

irregular edge leaving a well defined profile of physical imperfections that act as microblades.

The Working Angle Necessary To Conditioning The Friel Edge Is Very Different From The Angle Used To Sharpen The Edge Facets

In sharpening, the working angle between the sharpening surface and the facet is zero degrees. The sharpening angle is the facet angle.

(0053) "The sharpening process which must be designed to create full facets at the desired angle A can be carried out by any of the conventional means known to these skilled in sharpening including abrasive or skiving means..."

"The process of creating an optimum microstructure along the knife edge depends upon starting with a blade that has been sharpened sufficiently to establish well defined facets then by applying pressure at a low angular difference B alternating on one side, then the other of the edge until any burr remnants are removed leaving a microstructure along the edge."

[It is important to note that by maintaining a small angular difference B during this process, the edge can be reconditioned many times before it needs to be resharpened to create a fresh

facet at angle A.]

(0050) "For this reason it is now clear that there is a major advantage to creating a single apparatus 31 such as shown in Figures 17 and 18 including a sharpening station and an edge conditioning station 26, each with precisely controlled angles A and C respectively."

"The first (sharpening) stage 25 of this apparatus has elongated guide planes 23 each set at angle A relative to the blade face and the abrasive surfaces. The guide planes 24 in the second (edge conditioning) stage 26 each are set at angle C relative to the contact surface of hardened member 13."

(0023) "It is important to understand that the mechanism and accuracy of alignment must be sufficiently precise that the area of contact along the edge's facet is rigorously confined to the lower portion of the facet very close to the edge."

(0024) "This means that the initial area of contact with the hardened surface is confined to that area of the facet within about 0.002" (0.05 mm) of the edge itself."

(0039) "In creating the optimum edge structure by the novel and precise means described here the hardened contact surface 13 will

initially make contact with the facet only at the extremity of the facet 2, Figure 21 adjacent to the edge."

(0060) "The preceding descriptions disclose a number of skill-free means for reproducibly creating a uniquely uniform microstructure along the edge of a sharpened blade where the means incorporates a highly precise angular guiding system for the blade so that very narrow areas of the blade facets adjacent the edge can be repeatedly moved across a hardened surface at exactly the same angle, stroke after stroke."

Comment: In sharpening, the sharpening angle and the resulting facet angle are precisely the same angle (A).

In conditioning, the conditioning angle (C) and the facet angle (A) must be different in order to create the imperfections, microblades or microteeth) along the previously sharpened edge.

Unlike Sharpening Which Depends On An Abrasive Or Skiving Action, The Friel Conditioning Depends On A Different Process - Localized Stress Hardening Along The Edge To Create The Desired Microstructure

(0013) "After an edge has been sharpened using conventional techniques and is then pressed or dragged against a hardened surface "Contrary to popular belief, the burr created during the preceding sharpening step is not straightened but first is

deformed, removed, cracked, or pressed against one side of the edge and ultimately fragmented as micro sections along the edge are broken off leaving a micro serrated edge...This physical action of moving the burr fragments from one side of the edge to the other or pressing them against the edge causes serious breaks and irregularities along the edge structure...As one then continues to stroke the blade edge facets repeatedly across an appropriate hardened surface at the same consistent small relative angle, micro facets are established at the terminus of the larger facets and a small micro serrated structure is created".

(0021) "By repeating the step of pressing ultimately one side and then the other side of the edge against a hardened surface on the order of 10-20 times, at a precisely controlled angle, the attachment of the burrs to the terminus of the facets is broken and remaining pieces of the burr are broken off leaving an edge structure similar to that shown in Figure 7".

(0023) "The repetitive contacting causes the remaining edge structure to work harden and as a consequence repeatedly fracture leaving ultrafine microteeth along the edge."

(0049) "The process of repeatedly rubbing the knife facet and edge structure against the harder surface stress hardens (sic)

the facet adjacent to the edge, fractures the edge below the edge line and deforms the metal immediately adjacent to the edge."

Comment: This stress hardening and repeatedly fracturing of the edge to create the desired microstructure is radically different from the conventional sharpening process intended to create a very thin edge free of imperfections.

There Is A Significant Distinction Between The Hardened Surface Used In The Conditioning Technique Of This Invention And Conventional Sharpening Techniques Using An Abrasive Surface

(0041) "The hardened surface preferably will impart little to no conventional abrasive action against the edge structure. If there is any abrasive action along the edge it must be sufficiently small that it does not interfere significantly with the slow process of burr removal by non-abrasive means or prematurely remove the fine microstructure being formed along the blade edge."

(0047) "In general the hardened material should not be an abrasive. The described processes remove the burr, creates microteeth along the edge and wears micro amounts of metal from the facet adjacent the edge by basically a non-abrasive process. The rate of metal removal by any abrasive can easily be too

aggressive compared to the minuscule amounts of metal that will be removed by creating and recreating the ordered line of microteeth along the edge".

(0049) "As mentioned earlier, the hardened surface should not have an inherent tendency to abrade...The edge conditioning process disclosed here relies on precisely applied angular pressure by a hardened surface against the facet at its edge in order to repeatedly create and fracture a micro structure along the edge at the extreme terminus of the facets. The process of repeatedly rubbing the knife facet and edge structures against the harder surface...fractures the edge below the edge line and deforms the metal immediately adjacent to the edge. The metal along the lower portion of the facet adjacent the edge is deformed, smeared by the localized contact pressure and microsheared as a result of the very small differential angular alignment of the plane of the hardened surface and the plane of the edge facet. Thus, the localized contact pressure slowly fractures the microteeth along an edge and slowly and selectively re-angles the lower portion of the facet to conform closely to the plane of the hardened surface."

CLAIMED INVENTION

During the interview there was discussion with Examiner

Shakeri regarding how to define in the claims this aspect of the invention wherein the conditioning technique of this invention differs from prior conventional sharpening techniques. Examiner Shakeri suggested that consideration could be given to defining the invention in a Jepson type claim which would recite structure similar to conventional known sharpening devices wherein a guide member is provided for use with a blade contacting member for enhancing the physical structure of the blade. Such claim would point out that the improvement includes replacing a conventional abrasive sharpening member with a hardened surface of the type utilized with this invention. Consideration was also given with regard to how the non-abrasive characteristic of the hardened surface could be defined so as to differ from a conventional abrasive coated sharpening structure and still permit the claims to cover hardened surfaces which might have some small degree of abrasiveness. Examiner Shakeri suggested that this might be done by defining the "non-abrasive" characteristics of the hardened surface as a means plus function in the sense of any abrasiveness of the hardened surface being sufficiently low that it would still achieve the intended results which, however, would not be achieved if a conventional abrasive coated sharpening member were used, one having a significantly higher amount of abrasiveness.

With the suggestions of Examiner Shakeri in mind the independent elected claims directed to the conditioning apparatus have been replaced by a single independent claim, namely, claim

54. [As previously noted, however, allowable elected claim 11 has been retained as a separate independent claim.] Newly presented claim 54 is a Jepson claim which points out that the blade edge contacting member is the hardened surface of an object which is associated with the guide so as to dispose the facet of the edge at a predetermined non-zero degree angle B relative to the plane of contact with the hardened surface. Claim 54 also defines the hardened surface and knife guide combination in terms of means plus function in that it is "sufficiently non-abrasive which in combination with said knife guide comprises means to minimize interference with burr removal and repeatedly create and fracture a microstructure along the edge of the blade at the extreme terminus of the edge facets during repeated contact of the blade and said hardened surface to create a micro serrated edge." Conventional abrasive coated sharpening members could not achieve this function defined by the "means" of claim 54. Similarly, simply providing a guide for a non-abrasive hardened surface (if such were in the prior art) would not achieve the function of the defined means in the absence of combining the knife guide and hardened surface in such a manner so as to result in an angle B which creates a micro serrated edge as defined in claim 54.

Claims 2-10, 12, 15, 44-51 and newly added claims 55-56 are dependent on claim 54. Accordingly, those claims should be allowed by virtue of their dependency on claim 54, as well as for the features added by those claims.

Claim 53 is an elected independent claim directed to a method which incorporates the invention. It was understood that during the interview Examiner Shakeri indicated a preference for deleting from the preamble of that claim reference to "using" the apparatus. Accordingly, claim 53 is now directed to "A method of conditioning a knife-edge". Claim 53 includes various steps corresponding to structural features noted above in the discussion of claim 54. Accordingly, claim 53 should be allowed.

In order to advance the prosecution of this case the non-elected claims have also been reviewed and revised. There are now three independent non-elected claims. These are claims 41, 42 and 57. Each of these claims is directed to an assembly or apparatus which has at least two stages. One of the stages is an edge conditioning stage or apparatus which includes the guide and the substantially non-abrasive hardened surface.

Specifically, independent claim 57 is directed to a multi-stage assembly wherein there is an edge sharpening stage which has at least one abrasive surface for abrading the facet. The improvement in this assembly is the utilization of the edge conditioning stage. Claims 14 and 16-38 are dependent on claim 57.

Claim 41 is an independent claim directed to a combined apparatus which has a knife sharpener and an edge conditioning assembly of this invention. In claim 41 the conventional knife sharpener is a skiving surface.

Independent claim 42 is directed to "An apparatus which comprises a facet sharpening stage and an edge conditioning stage". Claim 42 is similar to claim 57 in that the facet sharpening stage is one which uses an abrasive member. Claim 42 includes accordingly, as part of that combination, an edge conditioning stage in addition to the sharpening stage. Claim 43 is dependent on claim 42.

For the sake of completeness it is noted that the Brinkley and Andrews patents had been relied upon in the rejection of various elected claims in the Office Action. Since those patents relate to sharpening structures and since parent claim 54 is directed to an edge conditioning apparatus which differs from such sharpening structures, the Brinkley and Andrews patents do not anticipate or make obvious the claimed invention. Similarly, the Brinkley and Andrews patents do not anticipate or make obvious the combination claims which are non-elected.

In view of the above amendments and remarks parent claim 54 and its dependent claims 2-10, 12, 15, 44-51 and 55-56 should be allowed as well as elected independent method claim 53, in addition to previously indicated allowable elected claim 11. If, in view of the allowance of these claims the restriction requirement is withdrawn then remaining claims 57 and its dependent claims 14 and 16-38 and claim 41-43 should also be allowed. Conversely, if the restriction requirement is maintained and the elected claims are otherwise considered

allowable, Examiner Shakeri is authorized to cancel the non-elected claims by Examiner's Amendment.

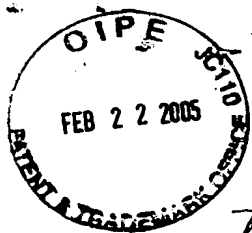
If Examiner Shakeri has any suggestions for placing this application in its best form for allowance he is respectfully requested to telephone the undersigned attorney.

Respectfully submitted,

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Annotated Sheets Showing Changes

Fig. 8.

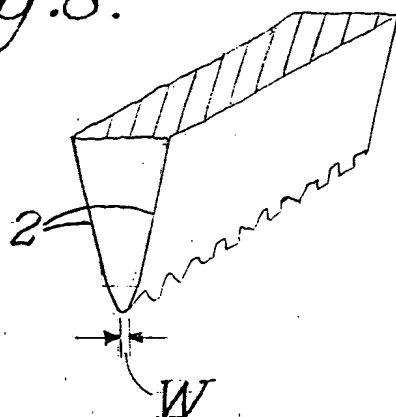


Fig. 9.

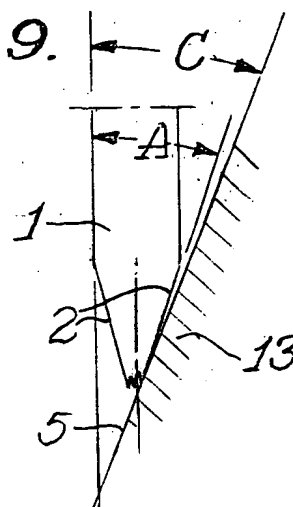


Fig. 10.

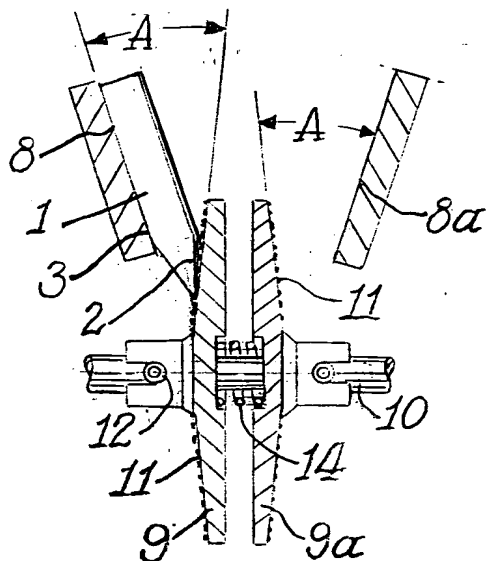


Fig. 11.

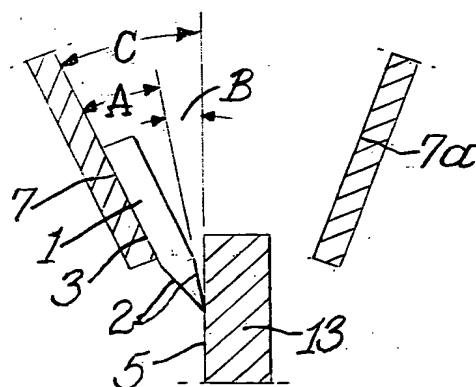


Fig. 12.

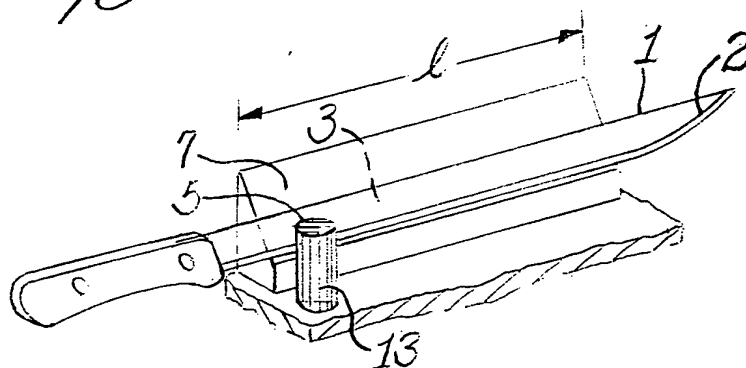


Fig. 11A.

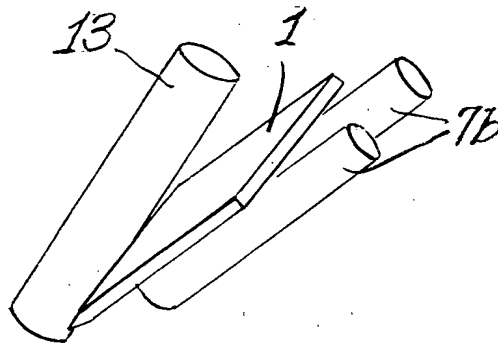


Fig. 13.

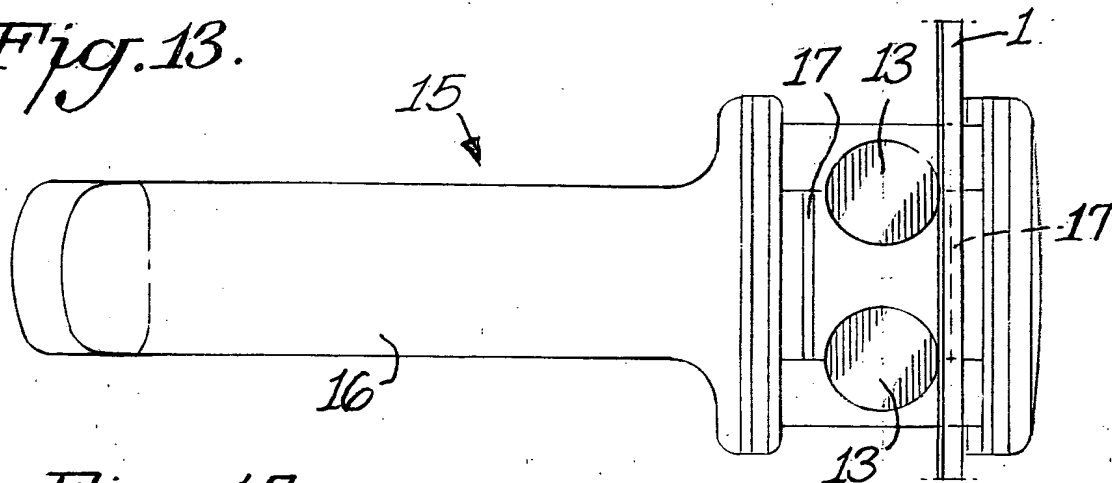


Fig. 14.

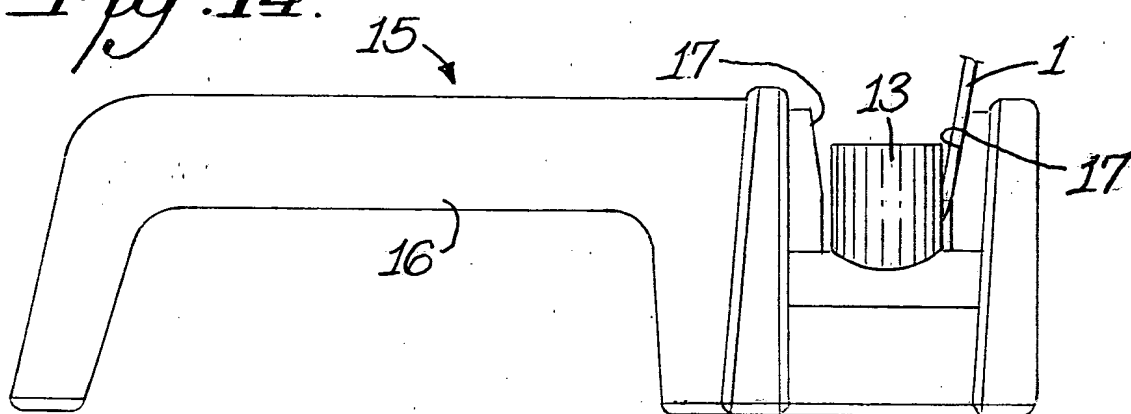


Fig. 15.

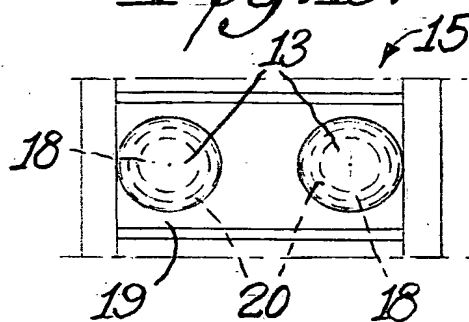


Fig. 16A.

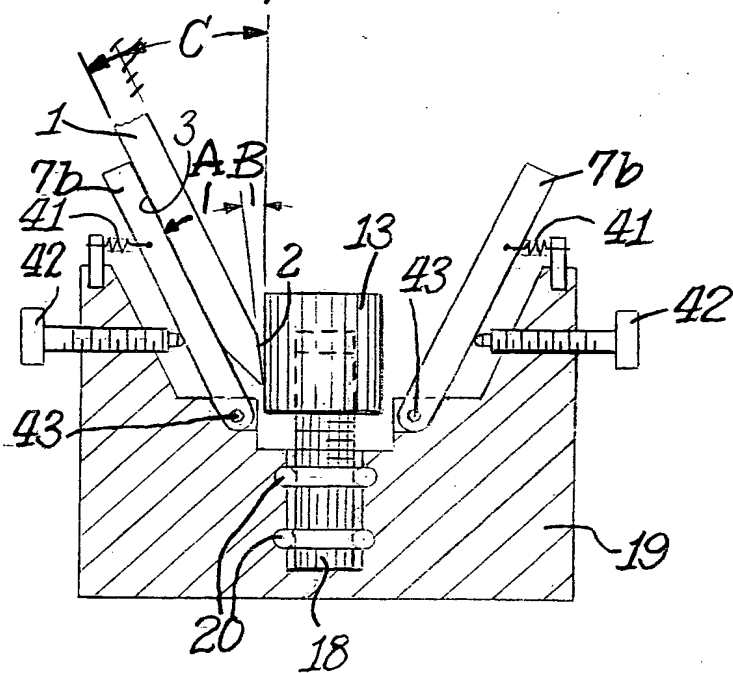


Fig. 16.

